LEXSEE 713 F.2D 731

IN RE ROBERT K. GRASSELLI and HARLEY F. HARDMAN, Appellants, and ROHM AND HAAS COMPANY, Intervenor

Appeal No. 83-504

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

713 F.2d 731*; *1983 U.S. App. LEXIS 13627*; *218 U.S.P.Q. (BNA) 769

July 15, 1983

PRIOR HISTORY: Serial No. 713,024.

DISPOSITION: [**1] AFFIRMED IN PART and REVERSED IN PART.

COUNSEL: Ford F. Farabow, Jr., of Washington, District of Columbia, argued, for Appellant. With him on the brief was David W. Hill, Herbert D. Knudsen and David J. Untener, of Cleveland, Ohio, of counsel.

Dale H. Hoscheit, of Washington, District of Columbia, argued, for Intervenor. With him on the brief was George W.F. Simmons, of Philadelphia, Pennsylvania, of counsel.

Gerald H. Bjorge, of Arlington, Virginia, argued, for Appellee. With him on the brief were Joseph F. Nakamura, Solicitor and Fred E. McKelvey, Associate Solicitor.

JUDGES: Bennett, Smith, and Nies, Circuit Judges.

OPINION BY: NIES

OPINION

[*732] NIES, Circuit Judge.

This appeal is from the decision of the United States Patent and Trademark Office (PTO) Board of Appeals (board) affirming the final rejections under *35 U.S.C. § 103 (1976)* of claims 1-34, all of the claims of reissue application serial No. 713,024 filed August 9, 1976. We reverse with respect to claims 15 and 19-32 and affirm the board's decision with respect to all other claims.

I

The original patent sought to be reissued here, *U.S. Patent No. 3,642,930* (issued on February 15, 1972, to Standard Oil Company, Cleveland, [**2] Ohio), is directed to catalysts containing an alkali metal as an essential catalytic ingredient. As claimed, the catalyst composition must contain, in addition to the alkali metal, bismuth, iron and molybdenum in oxide form. [1] Such alkali metal catalyst compositions are asserted, in the patent, to be an improvement over prior art catalysts in that they are particularly suited to the catalytic oxydehydrogenation of isoamylenes, methyl butanols, or mixtures thereof to isoprene.

1 In the discussion below, this base catalyst is referred to as a four-component catalyst.

By this reissue application under *35 U.S.C. § 251 (1976)*, inventors Grasselli and Hardman (hereafter appellants) have presented claims additional to those of the patent: claims directed to catalysts requiring the essential alkali metal component to be potassium, cesium, or rubidium; claims requiring inclusion of preferred additives, and claims requiring activation of the catalyst at 500 degrees F, and up to 1250 degrees F.

Specifically, the subject [**3] application for reissue sets forth claims to a catalyst composition in claims 6-34, and to a process for catalytic isoprene production in claims 1-5. Claims illustrative of that process and catalyst composition are set forth below:

> 1. The process for the conversion of isoamylenes, methyl butanols or mixture thereof to isoprene comprising contacting

said isoamylenes, methyl butanols or mixtures thereof with a molecular oxygen-containing gas over a catalyst consisting essentially of an activated catalytic oxide complex described by the following formula:

Bi[a]Fe[b]Mo[c]Q[d]R[e]T[f]M[g]O[x]

wherein	Q is an alkali metal,
	R is an alkaline earth metal,
	T is phosphorus, arsenic or antimony,
	M is cobalt and/or nickel, and
wherein	a, b and c are numbers in the
	range of
	0.1 to 12,
	d is a number from 0.1 to 8,
	e is a number from 0 to 8,
	f is a number from 0 to 6,
	g is a number from 0 to 12, and
	x is a number determined by the
	valence requirements of the
	other elements present,

[*733] in a reaction zone maintained at from about 500 degrees F. to about 1100 degrees F. at from about 0.5 to about 10 [**4] atmospheres pressure with a contact time of from about 0.01 second to 50 seconds, and recovering the isoprene.

6. A catalyst composition consisting essentially of an activated catalytic oxide complex of an alkali metal, bismuth, iron and molybdenum as essential catalytic ingredients, and defined by the following formula:

Bi[a]Fe[b]Mo[c]Q[d]R[e]T[f]M[g]O[x]

wherein	Q is an alkali metal,
	R is an alkaline earth metal,
	T is phosphorus, arsenic or antimony,
	M is cobalt and/or nickel, and
wherein	a, b and c are numbers in the
	range of 0.1 to 12,
	d is a number from 0.1 to 8,
	e is a number from 0 to 8,
	f is a number from 0 to 6,
	g is a number from 0 to 12, and
	x is a number determined by the
	valence requirements of the other
	elements present.

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7. The composition of claim 6 wherein Q is potassium.

14. The composition of claim 7 wherein M is cobalt and wherein activation of the catalytic oxide complex is con-

> ducted at 500 degrees F to 1250 degrees F in the presence of an atmosphere consisting essentially of air.
>
> 15. The composition of claim 6 wherein Q is potassium and M is cobalt, and wherein e equals 0, f equals [**5] 0 and g is a number larger than 0.
>
> 17. The composition of claim 7 wherein activation of the catalytic oxide complex is conducted at 500 degrees F in the presence of an atmosphere consisting essentially of air.
>
> 19. The composition of claim 6 wherein Q is cesium.
>
> 26. The composition of claim 6 wherein Q is rubidium.

As can be seen from the above, the preferred alkali metals, potassium, cesium, and rubidium, are recited in claims 7, 19 and 26. Claims 14 and 17 recite the temperature at which the catalyst compositions can be activated. Catalyst composition claims, depending from claims 6, 7, 19 and 26, refer to inclusions of optional components expressly recited in claim 6, specifically phosphorus (claims 8, 23 and 30); cobalt (claims 9, 14, 15, 21, 28, 34); nickel (claims 10, 13, 20, 27, 33); mixtures of cobalt and nickel (claim 12); antimony (claims 16, 24, 29) and arsenic (claims 22, 31). Other claims depending from claims 7, 19 and 26 specify that the catalyst is supported on silica (claims 18, 25 and 32).

II

Notwithstanding its expedited case status, the instant reissue application has been pending for seven years. The many issues, considered in this appeal, are in part [**6] attributable to the efforts of Rohm and Haas who vigorously protested this reissue, by appearance during ex parte prosecution, by briefing and oral arguments before the board, and here as an intervenor. [2]

> 2 The Rohm and Haas motion to intervene here was granted in view of Rohm and Haas's status as a protestor in these reissue proceedings and because the catalyst that Rohm and Haas uses for the oxidation of propylene to acrolein (a catalytic oxidation of an olefin to an unsaturated aldehyde) was accused in an International Trade Commission ("ITC") proceeding of infringing the Grasselli and Hardman catalyst claims. *See Rohm & Haas v. ITC, 64 C.C.P.A. 170, 554 F.2d 462, 193 U.S.P.Q. (BNA) 693 (1977)*. The ITC proceedings were terminated at Standard Oil's behest prior to a determination on the merits, following which Standard Oil sought reissue.

These reissue proceedings have twice been appealed to the board. Consequently, two decisions by the board are being reviewed here. As a result of both decisions, there are twelve [**7] separate grounds of rejection of the claims, all under *35 U.S.C. § 103*, [3] which were affirmed by the board and are the subject of this appeal.

> 3 *§ 103* provides:
>
> *§ 103*. Conditions for patentability; non-obvious subject matter
>
> A patent may not be obtained though the invention is not identically disclosed or described as set forth in *section 102* of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

[*734] During the first appeal, the board affirmed the examiner's final rejections, based on the following four references which disclose alkali metals, or compounds thereof, in catalysis processes.

Japanese Patent Publication No. 41-11847/1966,	
June 29, 1966	(Japanese Patent)
U.S. Patent No. 3,205,280 -	
Wattimena et al.	(U.S. Wattimena)
U.S. Patent No. 3,621,072 -	

Watanabe et al.	(Watanabe)
U.S. Patent No. 3,415,886 -	
McClellan	(McClellan)

[**8] The Japanese Patent Publication No. 41-11847/1966 (Japanese Patent) was cited as a "new ground" of rejection in the examiner's answer in the first appeal to the board as a result of five affidavits, filed by Rohm and Haas, apparently purporting to show that Example 4 of the Japanese Patent produced a product within appellants' claims.

The examiner did not make the additional rejections based on other prior art references as suggested by Rohm and Haas.

However, in the board's first decision, pursuant to its authority under 37 C.F.R §§ 1.196(b) and 1.196(d) (Rules 196(b) and 196(d)), [4] the board did entertain Rohm and Haas's suggestions to make those additional rejections on the following references:

U.S. Patent No. 3,226,422 -- Sennewald et al.

U.S. Patent No. 3,346,617 -- Hiroki et al.

U.S. Patent No. 3,414,631 -- Grasselli et al. (Grasselli '631)

U.S. Patent No. 3,454,630 -- Yamaguchi et al.

British Patent 973,565 -- Wattimena et al. (British Patent)

4 § 1.196(b) provides:

> (b) Should the Board of Appeals have knowledge of any grounds not involved in the appeal for rejecting any appealed claim, it may include in the decision a statement to that effect with its reasons for so holding, which statement shall constitute a rejection of the claims. The appellant may submit an appropriate amendment of the claims so rejected or a showing of facts, or both, and have the matter reconsidered by the primary examiner. The statement shall be binding upon the primary examiner unless an amendment or showing of facts not previously of record be made which, in the opinion of the primary examiner, avoids the additional ground for rejection stated in the decision. The appellant may waive such reconsideration before the primary examiner and have the case reconsidered by the Board of Appeals upon the same record before them. Where request for such reconsideration is made the Board of Appeals shall, if necessary, render a new decision which shall include all grounds upon which a patent is refused. The appellant may waive reconsideration by the Board of Appeals and treat the decision, including the added grounds for rejection given by the Board of Appeals, as a final decision in the case.

§ 1.196(d) provides:

> (d) Although the Board of Appeals normally will confine its decision to a review of rejections made by the primary examiner, should it have knowledge of any grounds for rejecting any allowed claim that it believes should be considered, it may include in its decision a statement to that effect and remand the case to the primary examiner for consideration thereof. In such event, the Board shall set a period, not less than one month, within which the appellant may submit to the primary examiner an appropriate amendment, or a showing of acts or reasons, or both, in order to avoid the grounds set forth in the statement of the Board of Appeals. If the primary examiner rejects the previously allowed claim or claims on the basis of such statement, the appellant may appeal to the Board of Appeals from the rejection. When-

> ever a decision of the Board of Appeals includes a remand, that decision shall not be considered as a final decision in the case, but the Board of Appeals shall, upon conclusion of the proceedings before the primary examiner on remand, either adopt its decision as final or render a new decision on all of the claims on appeal, as it may deem appropriate.

[**9] Specifically, the board's first decision contained a recommendation to the examiner, [*735] in accordance with Rule 196(d), to reconsider the examiner's allowance of certain claims in view of the above references. After remand of the case to the examiner, and during prosecution before him, various declarations and affidavits were presented by both Rohm and Haas and appellants. Relying on *37 C.F.R. § 1.198*, [5] the examiner refused to consider appellants' declarations and affidavits, after having specifically been entered by petition to the Commissioner, on the ground that the experiments therein related only to rejections affirmed by the board in its first decision.

5 *§ 1.198* provides:

> Cases which have been decided by the Board of Appeals will not be reopened or reconsidered by the primary examiner except under the provisions of § 1.196 without the written authority of the Commissioner, and then only for the consideration of matters not already adjudicated, sufficient cause being shown.

Since [**10] the board's second decision is expressly limited to consideration of the rejections originally proposed by the board under Rules 196(b) and 196(d), the board apparently adopted, at least in part, the examiner's reasoning for refusing to consider appellants' affidavits and declarations filed during the remand period.

As a result of the subsequent prosecution and the board's second decision, all of appellants' claims (original as well as new claims) stand rejected under *35 U.S.C. § 103*. Specifically, the following grounds apply:

Claims	References
1-7, 11, 19, 25, 26, 32	U.S. Wattimena
11, 16, 19, 23-26, 29,	Watanabe
30, 32	
1-15, 18-21, 23, 25-28,	McClellan
30, 32-34	
6, 7, 11-15, 18-21,	Japanese Patent
25-28, 32-34	
12-15, 18, 20, 21, 27, 28,	U.S. Wattimena taken with
33, 34	the British Patent
16, 24, 29	McClellan taken with
	Grasselli '631
16, 24, 29	Japanese Patent
6-8, 11, 16, 19, 23-26,	Sennewald et al. in
29, 30, 32	combination with Hiroki et al.

Claims	References
5, 9-13, 15-16, 18-34	Yamaguchi et al. or Grasselli
	'631 taken with Watanabe
17, 22, 31	Sennewald et al. in combination
	with Hiroki et al.
22, 31	Grasselli '631 in view of
	Watanabe and appellants' admissions.
17, 22, 31	McClellan in view of
	Grasselli '631.

[**11] III

To set the context of the issues here, it is emphasized that all rejections made by the PTO are under *35 U.S.C. § 103*. No written description of a catalyst embraced by the appealed claims appears in the prior art applied in the various rejections. *In re Marshall, 578 F.2d 301, 198 U.S.P.Q. (BNA) 344 (CCPA 1978)*; *In re Arkley, 59 C.C.P.A. 804, 455 F.2d 586, 172 U.S.P.Q. (BNA) 524 (CCPA 1972)*. However, Rohm and Haas put forth a theory of inherency, normally the basis for rejection under *35 U.S.C. § 102*, that the board apparently adopted.

In any event, the issues here relate to the determination of obviousness, or nonobviousness, of claims directed to a catalyst composition with four essential components: bismuth, iron, molybdenum and an alkali metal, as well as to claims of a method using that catalyst.

Appellants take the position that none of the rejected claims would have been *prima facie* obvious from the prior art. In essence, appellants argue that catalysis is unpredictable and that the board has equated very different catalysts and very different reactions with those of appellants to support the rejections.

Alternatively, if the claims appear to have been *prima facie* obvious, [**12] appellants argue that rebuttal evidence of record negates this conclusion. Primarily, appellants rely on Friedrich I, Friedrich II, Friedrich III and Friedrich IV declarations, although other declarations (and affidavits) were filed on behalf of appellants corroborating, supporting, or adding to information set forth in the four Friedrich declarations. [6] Specifically, appellants ask this court to [*736] consider, although the board did not, the experiments and evidence of Friedrich III and IV with respect to rejections affirmed by the board in its first decision.

6 These are by Baldwin, Strecker, Callahan and Grasselli et al. Rohm and Haas, too, has filed various declarations and affidavits. These are by Kennelly, De Jong, Lade, Bauer and Nemec.

IV

The examiner held that appellants' claimed catalyst and method of use would have been obvious on the basis of teachings in any one of the following references: Japanese Patent; U.S. Wattimena, Watanabe, or McClellan. These four references were asserted as [**13] four separate grounds of rejection which were the subject of the first appeal. As the PTO treated these four references as the references most material to the issue of patentability of all of the rejected claims, they will be considered first; for analysis, we find it convenient to discuss them starting with Watanabe.

A

Watanabe (U.S. Patent No. 3,621,072)

Appellants argue, and we agree, that the board erred in holding that any of appellants' claims would have been obvious from the teachings of Watanabe. [7]

7 Although appellants had argued in the first appeal, and do here, that Watanabe "falls short of establishing a *prima facie* case of obviousness," appellants filed a declaration under *37 C.F.R. § 1.131* "in order to simplify the issues on appeal," during the remand period between the first and second appeals to the board. In the board's second decision, the board reversed the rejections of certain claims over Watanabe, finding the declaration sufficient to antedate the reference with respect to those claims. As the Watanabe reference does not establish a prima facie case of obviousness, we need not treat the remaining issues arising under *37 C.F.R. § 1.131*.

[**14] Watanabe describes a catalytic conversion of a mixed gas of isobutylene, methanol and/or ethyl ether to isoprene. The catalyst used by Watanabe is de-

scribed to be at least one oxide of tungsten, vanadium, molybdenum, uranium, copper, iron, and chromium. Various Watanabe examples employ as the catalyst one oxide of the aforementioned elements; one of the examples employs as a catalyst a mixed oxide system of molybdenum-vanadium-uranium-tungsten.

In the board's view Watanabe is pertinent under *35 U.S.C. § 103* for the sole reason that:

> We note the explicit *suggestion* by these patentees *to add* compounds of *alkali metals such as sodium or potassium* to the catalysts, to increase isoprene selectivity. [Emphasis added.]

Watanabe describes the addition of promoters to the catalyst, to inhibit side reactions and increase product selectivity. These promoters are described to be compounds of phosphorus, sulfur, boron, antimony, bismuth, tellurium, silver, barium, calcium, magnesium, potassium and sodium. Of the 22 Watanabe examples, 10 describe the use of promoters. None of the specific examples relies on the use of sodium or potassium as a promoter.

The "promoted [**15] catalysts" actually described therein -- oxides of the following systems: uranium-antimony; tungsten-tellurium; molybdenum-phosphorus; molybdenum-sulfur; vanadium-sulfur; molybdenum-bismuth-phosphorus and calcium-bismuth-molybdenum-phosphorus -- differ significantly from the subject compositions. Even if sodium or potassium were substituted, in any one of the exemplified "promoted" catalysts, for the identified promoter(s), and were operative therein, any composition thus created is deficient in at least one element of appellants' catalyst and there is no objective basis to add the missing element(s) to create the composition as claimed. Thus, appellants' catalyst composition cannot be held to have been obvious from Watanabe alone.

B

Wattimena (U.S. Patent No. 3,205,280)

U.S. Wattimena describes butene production by dehydrogenating butane in the presence of a halogen, oxygen and a solid catalyst. [8]

> 8 Although it appears from the discussion above, in section II, that U.S. Wattimena and the British Patent (British Patent No. 973,565 to Wattimena) are used in two different grounds of rejection, this is not the case. The examiner and the board treated the British Patent to be cumulative to U.S. Wattimena. For purposes here, we will agree with the examiner and the board, in a way as adverse to appellants as possible, that the British Patent confirms the intention of U.S. Wattimena to disclose bismuth as a potential catalytic component.

[**16] [*737] According to U.S. Wattimena, the solid catalyst must contain "one or more alkali metal and/or alkaline-earth metal compounds"; and the preferred catalysts are reported to be those composed of potassium bromide, silver bromide and didymium chloride, on a support. U.S. Wattimena broadly suggests enhanced activity of the basic catalyst on "addition" of "one or more metal compounds derived from the transition elements of Groups I and IV to VIII of the Periodic Table and/or a rare-earth metal compound," such as the elements: zirconium, titanium, vanadium, chromium, molybdenum, manganese, tungsten, iron, cobalt, nickel, palladium, copper, silver and compounds thereof.

The rejections under *35 U.S.C. § 103* over Wattimena are based on the following description:

> A suitable *solid catalyst (plus carrier)* for the dehydrogenation of butene to butadiene has the following composition (in parts by weight): Al[2] O[3] 90.2; Si O[2] 9.0; Fe[2] O[3] 0.2; Mg O 0.1, Ca O 0.1; Na[2] O 0.1; K[2] O 0.1; and Ti O[2] 0.1. A catalyst which was successfully used in the dehydrogenation of n-butane contained, in addition, 1.7 "didymium oxide." 0.6 Na[2] O, and 1.4 Mo O[3], [**17] the latter compounds as Na-molybdate. In another similar case, the additional compounds consisted of 11.4 Bi[2] O[3] and 7.0 Mo O[3] parts by weight. Excellent results were also obtained with a solid catalyst consisting of 100 Si O[2]; 19.9 "didymium 17.1 Mo O[2] and 3.7 Na[2] O parts by weight.

U.S. Wattimena, col. 4, lines 38-49 (emphasis added).

As framed by the parties, the issue posed by Wattimena resides in an *interpretation* of the description of the first composition of eight components (Al[2] O[3], Si O[2], Fe[2] O[3], Mg O, Ca O, Na[2] O, K[2] O and Ti O[2]), particularly in light of the language "solid catalyst (plus carrier)." Two extremely divergent views in interpreting this description have been argued.

On the one hand, it is argued that appellants' catalyst, for example as in claim 6, would have been obvious from the *whole* of the above excerpt from Wattimena

inasmuch as the four components of appellants' catalyst would be found together if Bi[2] O[3] and Mo O[3] are added as suggested in the third sentence of the above excerpt, (albeit as a ten-component composition); [9] however, it is noted, the excerpt fails as a [**18] direct anticipation because, *inter alia*, the eight-component composition contains Ti O[2], described as a catalytic component by U.S. Wattimena but not recited in appellants' claims as a catalytic component.

9 Declarations filed by Friedrich (Friedrich I) and Strecker on appellants' behalf have been considered. These declarations attempt to show that the written description fails to produce appellants' catalyst and pertains to X-ray study comparisons of the eight-component composition, described in Wattimena, excerpted above, and of the composition resulting from the addition of Bi[2] O[3] and Mo O[3] to that eight-component composition. These declarations are not considered to be dispositive of the issue attempted to be proven, as there is, *inter alia*, no X-ray study of a four-component catalyst, of, for example, appealed claim 6, in the study.

On the other hand, appellants argue that the eight-component composition described in the excerpt above must be construed as constituting a *carrier* [**19] . To buttress this argument, appellants rely on information in brochures, as well as other evidence in the record of this appeal, which shows that Norton alpha aluminas (catalyst carriers) comprise each of the eight components (Al[2] O[3], Si O[2], Fe[2] O[3], Mg O, Ca O, Na[2] O, K[2] O and Ti O[2]) in substantially similar, though not identical, proportions to the eight-component composition in the Wattimena description excerpted above and relied upon by the [*738] PTO in the rejections under *35 U.S.C. § 103*. [10]

10 The evidence, brochures and other information, includes an April 4, 1977, letter from James D. Ball of Norton Company Chemical Process Products Division; a typical chemical analysis of the SA-5105 (SA-105) catalyst carrier, a Norton alpha-alumina; Bulletin CC-10 entitled "Catalyst Carrier," (1974); a chemical analysis sheet for SA-5205, augmenting information in Bulletin CC-10; and a comparison of the old product, the then current (1977) product and the product sent to Standard Oil Company.

The Baldwin declaration confirms the fact that Norton alpha aluminas (for example, Norton SA 105) predate the application filing date of the original patent sought to be reissued; none of the arguments here dispute that fact.

[**20] In our view, the effect of this information concerning the composition of the Norton alpha-alumina carrier is not to interpret what was intended by Wattimena's description, but to shift the burden of going forward to the PTO. It then became incumbent on the PTO to show that Wattimena itself would suggest adding two components and selecting out at least the four essential components of appellants' catalyst, or that there was some reasonable basis in the prior art to make the selection claimed here. *See In re Sasse, 629 F.2d 675, 681, 207 U.S.P.Q. (BNA) 107, 111-12 (CCPA 1980)*. The PTO failed to counter appellants' showing and, accordingly, we do not sustain claim rejections based on U.S. Wattimena.

C

The Japanese Patent Publication 41-11847 (Japanese Patent)

The Japanese Patent is directed to improving the selectivity of a known process for producing propylene oxide (the epoxide) by decreasing isomerization reactions which result in the by-product propionaldehyde. This improvement is achieved by modification of process conditions but does not rely on use of any particular catalyst system.

In fact, the Japanese Patent suggests no criticality as to the catalyst composition: That is, [**21] the Japanese Patent indicates that any "metal and/or metallic oxide system" based on "copper, silver, molybdenum, bismuth, vanadium, antimony, tungsten, cobalt, nickel, manganese, chromium, tin, selenium, or iron" may constitute the catalyst. Catalysts used in Examples 1-3 and 5-12 vary widely in composition, for example, from silver or silver oxide alone to systems including copper, tin, and selenium.

The contribution of the Japanese Patent, the modification of the propylene oxide production process conditions to improve selectivity, requires both *inclusion of a peroxide* or a peroxide source in the feed stream of propylene and oxygen *and* addition of a *basic organic or inorganic substance* (hereinafter "basic modifier") to an "ordinary" oxidation catalyst of a metal and/or metallic oxide system. The basic modifier is broadly described as organic or inorganic, solid or liquid, either a strong base or a weak base. In the examples, triethanol amine, 2,3,4-trimethyl pyridine, sodium carbonate, sodium hydroxide and potassium hydroxide are used as the source of the basic modifier. [11]

11 Significantly, the Japanese Patent does not describe "alkali metal(s)" either in conjunction with the description of the catalyst or in conjunction with the basic modifier.

[**22] Within the confines of the patent, a number of examples of the improved process are given. But for Example 4 the entire disclosure is otherwise of no interest.

In Example 4, the first stage in the process requires admixing potassium hydroxide (as the source of the modifier) with stearic acid containing a calcined mixture of the salts of bismuth, iron and molybdenum. The pertinent portion of Example 4 reads:

> Example 4:
>
> 110 gm of ammonium molybdate was dissolved in 150 cc of hot water. Separately a dispersion of 150 gm of bismuth nitrate and 50 gm of ferric nitrate in 100 cc of 1N nitric acid solution was prepared. The solutions were mixed to form a milky brown precipitate. The precipitate was dried at 110 degrees C, crushed, 1% by weight of stearic acid added and molded to circular tablets 5 mm diameter X 5 mm, then calcined at 400 degrees C for 16 hours. The catalyst [*739] thus obtained is referred [to] as Catalyst-C (comparative example).
>
> 15 cc of 1N potassium hydroxide solution was added to the Catalyst C and the product obtained by drying it at 120 degrees C is referred [to] as Catalyst D (example of this invention).

It is apparent that no written description [**23] of the claimed compositions is given in Japanese Patent Example 4 and the board refused to hold the Japanese Patent to be a direct anticipation. *In re Arkley, 59 C.C.P.A. 804, 455 F.2d 586, 172 U.S.P.Q. (BNA) 524 (CCPA 1972)*. Without explanatory comment, the board, nevertheless, adopted the examiner's reasons for affirmance of the *§ 103* rejections based *not* on any interpretation of the *prior art* embodied by the Japanese Patent, but on extraneous evidence in the form of affidavits filed by Rohm and Haas during the examination of the subject reissue application in support of its assertion that appellants' catalyst was anticipated by Japanese Patent Example 4, a position it urged before the board.

It is fundamental that rejections under *35 U.S.C. § 103* must be based on evidence comprehended by the language of that section. *In re McKellin, 529 F.2d 1324, 1329, 188 U.S.P.Q. (BNA) 428, 433 (CCPA 1976)*. We consider the affidavits not because of their competency as prior art but rather because of the *inferences of inherency* which underlie the PTO's *§ 103* rejections based on the Japanese Patent and which are not consistent with the description of the Japanese Patent, set forth above. If [**24] the affidavits fail to show that Japanese Patent Example 4 produces a composition within the rejected claims, *a fortiori*, they evidence nothing relevant to the patentability of the rejected claims.

Inherency would be established either if the portion of Example 4 excerpted above produces the four-component catalyst; or if the Example 4 catalyst is converted to the four-component catalyst when it is subjected to temperatures of propylene oxide production described in other portions of Example 4.

The issue of inherency is a question of fact. *In re Fracalossi, 681 F.2d 792, 794, 215 U.S.P.Q. (BNA) 569, 571 (CCPA 1982)*. Five affidavits, apparently presented by Rohm and Haas to support the above two arguments, fail to establish such critical facts. The affidavits state that a reaction product is formed (by a test with pH paper) when the potassium hydroxide is added to the stearic acid containing the calcined mixture of salts of bismuth, iron, and molybdenum when the synthesis of Japanese Patent Example 4 is followed, and that the potassium content of that reaction product remains substantially constant, whether it is merely dried at 120 degrees F or subsequently heated at 340 degrees C, [**25] or heated to 427 degrees C, and then to 538 degrees C. However, there is no evidence that that reaction product is one embraced by claims 6 and 7. Specifically, there is no evidence of record which shows that that reaction product includes potassium in the potassium oxide form. [12] If appellants' catalyst is inherent in the Japanese Patent, it has not been established by the record here and obviousness cannot be predicated on that which is unknown. Thus, we reverse the board's rejection on the Japanese Patent.

> 12 Moreover, the evidence in Friedrich II and Friedrich III comparing the catalyst of the Japanese Patent Example 4 to appellants' four-component catalyst, containing potassium as the essential alkali metal, shows that under certain catalytic reaction conditions the activity of appellants' four-component catalyst differs substantially from that produced by the Japanese Patent Example 4 and that activity is independent of amounts of potassium hydroxide used.

D

McClellan, U.S. Patent No. 3,415,886 [**26]

McClellan, *U.S. Patent No. 3,415,886*, is directed to bismuth molybdate-, or phospho-bismuth molybdate-(bismuth molybdate), on silica catalysts heat treated to temperatures of 750 degrees to 850 degrees C to convert crystalline bismuth molybdate to an amorphous phase.

Heat treatment to achieve this result may be undertaken in two stages, first at a temperature of 400 to 500 degrees C and then at a [*740] temperature of 750 to 850 degrees C. These catalysts are described to be useful in oxidative dehydrogenation, in propylene ammoxidation and isoprene production.

The significance of McClellan resides in its additional descriptions, relating to the presence of alkali metal in the catalyst and to the enhancement of catalytic activity by inclusion of promoters such as iron. Appellants argue, however, that McClellan actually teaches away from inclusion of alkali metal in the catalyst and, that as to promoters, McClellan contains merely a "shotgun" description of many elements for such use, which would not lead a person of ordinary skill to select the elements appellants require.

With respect to alkali metal inclusion, McClellan suggests that sodium and/or potassium may *contaminate* [**27] the McClellan heat treated catalyst if reactants containing sodium or potassium are employed, as a source of the molybdate, or if the silica sol used as the essential silica carrier contains either or both:

> Molybdenum oxide is usually obtained from aqueous ammonium molybdate; however, alkali molybdates can be used. When alkali molybdates such as sodium or potassium molybdate are used, sodium or potassium ion, which is difficult to eliminate completely, must be acceptable in the final catalyst. An atomic Na:Mo ratio of 1:4 must not be exceeded in order to maintain good directivity in the catalyst. After processing in the manner described in this invention, heat-treated compositions containing sodium or other alkali or alkaline earth metals in the acceptable metal/molybdenum ratio of 1:4 or less give X-ray evidence of the presence of the scheelite structure of crystalline Mx[1]/[x]BiMo[2]O[3], where x = valence of alkaline earth or alkali metal M. In view of the desirability of low sodium and potassium content in most catalysts, ammonium molybdate is a preferred source of the molybdenum component of the catalyst.
>
> * * *
>
> The catalyst of the invention involves use of silica [**28] as a support, and the silica must be added as colloidal silica, i.e., an aqueous silica sol (silica sols generally contain about 30-40% silica). The silica can be present in the final catalyst in any amount less than 90% and greater than 5%, but it is preferred that the catalyst contain about 27-75% by weight of silica. Certain commercial silica sols contain small amounts of sodium (e.g., one commercially available product of 30% SiO[2] content contains 0.3% Na[2]O as titratable alkali), but, as previously discussed, low levels of sodium appear to have no serious effect on the catalysts of this invention. When these commercial silica sols are used, the catalytic composition can have the following formula:
>
> Bi[a]P[b]Mo[12]Si[c]O[d]Na[e]
>
> Where a is 4, b is 0 to 2, c is 24 to 160, d is 1.5a + 2.5b + 36 + 2c + 0.5e and e is 0 to 3.

McClellan, col. 3, lines 1-65.

Although McClellan does indicate that sodium and/or potassium can adversely affect the "directivity" of catalysts, as well as methods for insuring the absence of alkali metal, McClellan's catalyst will tolerate sodium and/or potassium contamination to a specified extent. Moreover, Example 1 of the reference [**29] describes, as a result of McClellan's heat treatment (at 750 degrees C), an amorphous scheelite NaBiMo[2]O[8] catalyst. [13] McClellan describes sodium or potassium in a bismuth molybdate catalyst and the efficacy [*741] of the resulting composition for its intended use as a catalyst. The only missing ingredient is iron which, however, McClellan supplies.

> 13 Appellants argue that the language "activated catalytic oxide complex" in claims 1 and 6 and the language in claims 17 and 14 specifying temperatures of 500 degrees F and 500 to 1250 degrees F, respectively, as temperature of catalyst activation, serve as patentable distinction over McClellan which requires an ultimate calcination temperature of 750 degrees-850 degrees C. However, McClellan does indicate that the first stage of a two-stage calcination treatment may be undertaken at lower temperatures, 400 degrees to 500 degrees C, which can produce a catalyst, though a conventional one, and not McClellan's amorphous catalyst resulting from higher heat treatment, i.e., 750 degrees to 850 degrees C. McClellan does not state that sodium or potassium contamination of bismuth molybdate will not occur at 400-500 degrees C.

[**30] To enhance catalytic activity, McClellan enumerates iron, nickel, or cobalt, as well as various other elements, as promoters. Appellants argue that many elements are enumerated as promoters and that no specific promoted *catalyst* is described in McClellan. However, McClellan specifically indicates that addition of the promoters, iron, for example, (as well as "cobalt and nickel," recited in other claims) will enhance catalytic activity. Moreover, McClellan specifically describes how to apply these promoters:

> These promoters are usually applied by impregnation or surface coating of already formed bismuth molybdate of phosphomolybdate-on-silica catalysts. Thus, the metals can be added to the slurried catalyst as a salt or acid or the metal, e.g., as a compound which is thermally decomposable in situ to form the desired promoter. After the catalyst has been impregnated with such solutions, employed in concentrations adequate to provide the desired amount of material, the impregnated catalyst may be dried and calcined *at any desired temperature.*

McClellan, col. 5, lines 2-11 (emphasis added).

The descriptions of McClellan directed to adding iron, nickel and cobalt [**31] as promoters, how to make that addition, and the effect of that addition, once made, suggest a predictably operative result, a successful addition of those elements to McClellan's catalyst. *In re Mercier, 515 F.2d 1161, 185 U.S.P.Q. (BNA) 774 (CCPA 1975).*

In view of the McClellan description concerning the addition of *iron* as a promoter and the express statement concerning the tolerance of McClellan catalysts to limited amounts of sodium and potassium ion, we agree with the board that appellants' claimed catalyst composition of these four elements and claimed method would have been *prima facie* obvious from McClellan and in the absence of evidence to overcome this *prima facie* case the rejections of claims 1-15, 18, 33 and 34 must be affirmed.

However, we do not agree that McClellan also renders obvious appellants' catalysts containing cesium or rubidium as the essential alkali metal (appealed claims 19 and 26, and claims depending therefrom). Without express comment, the board apparently tacitly adopted the examiner's reasons for rejection:

> No *patentable distinction* was seen *in the claimed use of* cesium or rubidium rather than the sodium or potassium components [**32] taught by the patent. [Emphasis added.]

The reference to "patentable distinction," begs the inquiry under *35 U.S.C. § 103. Graham v. John Deere Co., 383 U.S. 1, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966).*

The only possible basis for rejecting appellants' catalyst composition claims requiring cesium or rubidium, not expressly described in McClellan, is the implicit assumption that the McClellan language "alkali metal" makes all elements of Group IA of the Periodic Table, lithium, sodium, potassium, rubidium, cesium and francium, equivalents for *modifying* bismuth molybdate *catalysts*. However, the known relationship of lithium, cesium, rubidium and francium to sodium and potassium, as Group IA elements, is not sufficient, in and of itself, to treat them as *interchangeable* in *catalyst* compositions. *In re Doumani, 47 C.C.P.A. 1120, 281 F.2d 215, 217, 126 U.S.P.Q. (BNA) 408, 410 (CCPA 1960).*

Moreover, there is no description in McClellan which suggests the equivalency inferred by the PTO. The language "alkali metal" as used in McClellan relates to practical sources of contamination of the bismuth molybdate catalyst, by sodium or potassium salts of the *molybdate* [**33] *source* or by sodium in the carrier. In view of the lack of description in McClellan, or in any other art or record here, of cesium and/or rubidium reactants or catalytic components, McClellan's caveat concerning the effect of alkali metal contamination of catalysts, and the express limit on the amount of alkali metal tolerated by McClellan heat-treated catalysts, we conclude that the efficacy of [*742] the cesium- and rubidium-containing compositions as catalysts in claims 19-32 could only be derived from scrutiny of appellants' specification. Accordingly, the rejections of claims 19-21, 23, 25-28, and 30 are reversed.

V

Turning to the issue of whether appellants have overcome the *prima facie* case of obviousness of claims 1-15, 18, 33 and 34 based on McClellan, we are faced with the question of what evidence must be considered. Appellants ask this court to consider all evidence in Friedrich I, II, III, and IV, as well as all other affidavit and declaration evidence of record. Appellants assert that the board erred in refusing to consider Friedrich III with respect to rejections based on McClellan alone. Friedrich III and Friedrich IV present rebuttal evidence relating [**34] to McClellan, as well as information and experiments responding to the board's criticisms of Friedrich II experiments relating to the Japanese patent.

Friedrich III and Friedrich IV, filed during the remand period after the first board decision, in which the rejections based on McClellan alone were affirmed, but before the second appeal, were ultimately entered as evidence by the Commissioner on equitable grounds, although the Commissioner acknowledged the examiner's reasons for refusing to enter the declarations; evidence therein related only to rejections already affirmed by the board in the first decisions. [14] The examiner refused to consider the rebuttal evidence in Friedrich III and IV as it pertained to the rejections which were the subject of the first appeal, even after entry of the two declarations by the Commissioner, for the following reason:

> Rule 198, however, does not authorize the Primary Examiner to consider matters already adjudicated, which Friedrich 111 [sic] declaration clearly attempts to force.

The board apparently adopted the examiner's reason without comment and expressly limited its second decision to consideration of the new rejections. [**35]

> 14 In granting appellants' petition from the examiner's refusal to enter Friedrich III and IV declarations, the Commissioner stated:
>
> > [1] It would be inequitable to deny applicants, who are the real parties of interest, as much right to participation and evidentiary showings [in Friedrich III and Friedrich IV] in their own reissue application as has already been accorded on the record to Protestor [by *de facto* entry and consideration of Rohm's declaration by Nemec, criticizing Friedrich III].
> >
> > * * *
> >
> > [2] It is noted that applicants, by virtue of filing a continuation reissue application, could formally introduce said declarations into the record, but with concomitant delays in ultimate resolution of the issues. It does not appear that such delay would serve any useful purpose. Furthermore, reference is again made to the already lengthy prosecution history of the instant case and the deferral of enforcement of the original patent as noted in Paper No. 89. Therefore, in view of the equities involved and in order to expedite the resolution of the issues in this case. . . . *The Primary Examiner is hereby directed to proceed* with dispatch as indicated in Paper No. 89 with the examination of the instant case including considering the Friedrich III and IV affidavits for their probative value and merit. [Emphasis added.]

[**36] Rule 198 proscriptions, relating to proceedings after the board's decision, are not relevant to a case remanded, as here, to the examiner by the board under Rule 196(d). Under Rule 196(d), a board decision including a remand is "not . . . considered as a final decision in the case." Accordingly, under the express provisions of the rule, the board, after the remand proceedings, "shall . . . either adopt its decision as final *or* render a new decision on all of the claims on appeal." (Emphasis added.) Express PTO policy interpreting Rule 196(d) suggests that the decision containing the remand is not appealable under *35 U.S.C. § 141*. Manual of Patent Examining Procedure, § 1213.04 (Oct. 8, 1981). Thus, it was error to apply Rule 198 in this instance.

All evidence presented by appellants should have been considered in connection with all rejections, and in view of the inordinate delays in these proceedings, we will proceed to do so.

Of most significance is the evidence in Friedrich III. By Friedrich III appellants sought to establish that appellants' four-component [*743] catalyst unexpectedly outperforms the composition of McClellan's Example 1 (modified to contain iron as [**37] a promoter). The experiment was made on the basis of appellant's catalyst containing sodium as the essential alkali metal component and activated at a temperature between 500 degrees and 1250 degrees F, in ammoxidation after 20 hours on stream to make acrylonitrile.

Initially, it is noted that appellants' process claims 1-5 are directed to isoprene production. Thus, the above comparison "in ammoxidation" is of no help with respect to overcoming the rejections of claims 1-5 and appellants do not so assert.

It is well settled "that objective evidence of nonobviousness must be commensurate in scope with the claims which the evidence is offered to support." *In re Tiffin, 58 C.C.P.A. 1420, 448 F.2d 791, 171 U.S.P.Q. (BNA) 294 (CCPA 1971)*. With respect to appellants' broad claims to a catalyst with "an alkali metal," the experiments detailed in Friedrich III, being limited to so-

dium only, are not commensurate in scope, and are, therefore, insufficient to rebut the prima facie case. No claim is directed to sodium as the essential alkali metal component. [15] Accordingly, the rejections based on McClellan alone have not been overcome notwithstanding the evidence in Friedrich III.

15 We have considered, and dismiss, intervenor's criticisms of the reproduction of the McClellan catalyst in Friedrich III. The ultimate unsupportable extension of the Rohm and Haas position is that appellants should modify McClellan descriptions to make a "composite" which is appellants' invention. *See* discussion in *In re Tiffin, 58 C.C.P.A. 1277, 443 F.2d 394, 399-400, 170 U.S.P.Q. (BNA) 88, 93 (CCPA 1971)*, *modified* (as to claims 1-3 and 10-16) *58 C.C.P.A. 1420, 448 F.2d 791, 171 U.S.P.Q. (BNA) 294 (CCPA 1971)*. Firstly, it was argued that the McClellan promoter should have been added prior to McClellan's critical calcination stage undertaken at 750 degrees to 850 degrees C. However, McClellan describes (in the generic teaching and in Example 1) undertaking catalyst calcination in two stages, the last stage at 750-850 degrees C; and then describes calcination of the catalyst impregnated with promoter "at *any* desired temperature" (emphasis added). Accordingly, McClellan suggests three calcination stages. The lack of criticality in McClellan's own description of the temperature of the calcination of catalyst impregnated with promoter can hardly be construed to require a temperature of 750-850 degrees C. Secondly, appellants are criticized for comparison of the two catalysts in ammoxidation; since McClellan expressly discloses use of McClellan catalysts in ammoxidation, an ammoxidation process is a reasonable reaction choice for comparative catalytic activity studies as to catalyst composition claims. Thirdly, intervenor criticizes the comparisons on the grounds that the compared catalysts selectivities are similar. This criticism would only have validity if the catalyst activity and resultant yields were similar, which is not the case here.

[**38] However, the evidence in Table II of Friedrich II, rebuts any case of *prima facie* obviousness of claim 15. Claim 15 defines appellants' catalyst to be a composition of potassium, iron, bismuth, molybdenum, and cobalt. In Table II of Friedrich II, appellants have shown that a catalyst of claim 15 results in a percentage improvement (in yield) of 94% over their own catalyst of claims 6 and 7, containing potassium, iron, bismuth, and molybdenum (exclusive of cobalt) in acrolein production at 400 degrees C, while at 310 degrees C, the percentage improvement is even greater, 479%. In evaluating this evidence, we have noted that actual acrolein yields increase with increasing temperature.

None of the prior art reviewed here, including McClellan, describes a catalyst more similar to that of claim 15 than those described in appellants' claims 6 or 7. Accordingly, that comparison in Table II of Friedrich II which shows that the claim 15 catalyst outperformed the others (i.e., claims 6 and 7) is evidence of unexpected superiority. This comparison, and the conclusion based thereon, is the ultimate extension of the "indirect showing of unexpected superiority" sanctioned by precedent. [**39] *In re Fenn, 639 F.2d 762, 208 U.S.P.Q. (BNA) 470, 473 (CCPA 1981)*; *In re Fouche, 58 C.C.P.A. 1086, 439 F.2d 1237, 1241-42, 169 U.S.P.Q. (BNA) 429, 433 (CCPA 1971)*. Accordingly, the rejection of claim 15 based on McClellan is reversed.

VI

The remainder of the rejections are those instituted by the board, pursuant to Rules 196(b) and 196(d). The grounds of rejections in the claim rejections are based on combinations of references. The grounds [*744] for the *section 103* rejections under Rule 196(b) and 196(d) will be considered below, not necessarily in an order relating to the significance of the art to the rejected claims, but rather with respect to the number of claims affected thereby.

A

Rejections Under 35 U.S.C. § 103 Over Hiroki and Sennewald

The examiner refused to entertain the Rohm and Haas suggestion to reject claims over the combination of Sennewald (*U.S. Patent No. 3,226,442*) and Hiroki (*U.S. Patent No. 3,346,617*), stating:

> Such a rejection would not be valid because there is insufficient basis for combining the Sennewald and Hiroki patents in the manner suggested.

However, in the board's first decision, the board added rejections of claims 6-8, 11, 16, 19, [**40] 23-26, 29, 30, and 32, over that combination and recommended similar rejections of allowed claims 17, 22, and 31. The board reasoned:

> We must disagree with the Examiner's view that these references are not properly combinable, because both are directed to catalytic compositions utilized in the pro-

> duction of methacrylonitrile from isobutylene.

The utility of the two different catalysts of the Sennewald and Hiroki references might suggest, as the board purported, interchangeability of the catalysts. However, the express descriptions of those references which indicate that components of the two catalysts are not interchangeable is material to the validity of the rejection of catalyst composition claims under *35 U.S.C. § 103*.

In the board's limited discussion of this ground of rejection, the board concerned itself mainly with Hiroki without commenting on Sennewald, save for the Sennewald description of utility. Hiroki is directed to modifying a bismuth phospho-molybdate catalyst to improve the yields in ammoxidation processes by increasing the alkalinity of the bismuth phospho-molybdate catalyst. In the express words of Hiroki:

> [The bismuth phospho-molybdate catalyst] [**41] is made "more alkaline," either by the addition to the bismuth phospho-molybdate catalyst of an alkali metal or alkaline earth metal, or by the substitution of arsenic and/or antimony for a part or all of phosphorous in the phospho-molybdate composition, or further by the addition to the substantial molybdate of an oxide or hydroxide of an alkali or alkaline earth metal.

Hiroki, col. 2, lines 13-20.

Specifically, Hiroki suggests three, apparently equivalent, ways to increase the alkalinity of bismuth phospho-molybdate catalysts. The board treated those three ways of rendering the phospho-molybdate "more alkaline," as equivalent in making the rejection. This is not error as we find no description in Hiroki to indicate otherwise.

Hiroki was applied in the rejection for its suggestion to add alkali metal to a bismuth phospho-molybdate catalyst. Sennewald, silent with respect to alkali metal content, is combined with Hiroki for the Sennewald disclosure of iron addition to bismuth molybdate and to phospho-molybdate catalysts.

Sennewald characterized the improvements over prior catalysts to be based on the following differences "in the content of iron as an additional catalyst [**42] component and in the omission of such metals as tungsten, antimony and tin." Omission of antimony, as described by Sennewald, is inconsistent with the express object of Hiroki, to render the bismuth phospho-molybdate catalyst "more alkaline" by the addition of antimony and/or arsenic or its equivalent, the addition of alkali metal or alkaline earth metal.

The board's error, in rejecting claims over Hiroki and Sennewald, lies in its failure to recognize the express prohibition against inclusion of antimony in Sennewald's catalysts. In contrast, we have Hiroki's express statement as to interchangeability of alkali metal and antimony with the same beneficial result. Logical inquiry into the express statements of these two references would suggest lack of interchangeability of the [*745] respective catalytic components. Appellants' successful combination of alkali metal, iron, bismuth and molybdenum for a catalyst composition is contrary to these art descriptions.

Accordingly, we agree with the examiner's original conclusion and reverse the rejections under *35 U.S.C. § 103* of claims 6-8, 11, 16-17, 19, 22-26, and 29-32 over Sennewald in combination with Hiroki.

B

Rejections [**43] *of Claims over Watanabe, Together with Other Evidence*

In additional grounds of rejection, Watanabe was combined by the board with two other references, Yamaguchi, *U.S. Patent No. 3,454,630*, and Grasselli '631. Certain statements made by appellants with respect to Grasselli were treated as admissions, but these statements do not add information in addition to that of Grasselli '631 itself.

Turning to the substance of the rejections, the Watanabe catalyst systems discussed in section IV (composed of at least one oxide of tungsten, vanadium, molybdenum, uranium, copper, iron and chromium) differ significantly from those of Yamaguchi and Grasselli '631, each of which may require in combination, *inter alia*, iron, bismuth and molybdenum, and each of which differs from the other as to essential additional components. Specifically, Yamaguchi catalysts are oxides of iron, bismuth, phosphorus, molybdenum and nickel or cobalt or both nickel and cobalt, while Grasselli '631 embraces as one catalyst system an oxide system of iron, bismuth, molybdenum, and either nickel or a combination of iron and nickel optionally containing phosphorus, antimony, and tin.

Notwithstanding the Watanabe [**44] "suggestion" to use sodium or potassium as a promoter, which is the board's sole reason for reliance on Watanabe, we find no suggestion in Watanabe to look to the description embodied by Yamaguchi or Grasselli '631, or vice-versa, and we find no evidence suggesting interchangeability of Watanabe's catalyst compositions with those required by the other two references. Absent such suggestions, the

description of Watanabe when viewed in terms of catalysts actually exemplified in the 22 examples, provides no reasonable basis for adding Watanabe's sodium or potassium to the combined oxides of iron, bismuth and molybdenum of Yamaguchi and Grasselli '631. In our view, the description of Watanabe, as a whole, would not provide the required reasonable expectation of successful addition of sodium or potassium to catalysts described in the two primary references. *In re Clinton, 527 F.2d 1226, 188 U.S.P.Q. (BNA) 365, 367 (CCPA 1976)*; *In re Mercier, 515 F.2d 1161, 185 U.S.P.Q. (BNA) 774 (CCPA 1975).*

C

The Rejections Under Rule 196(b) and (d) of Claims 16, 17, 22, 24, 29 and 31

As noted in section II above, there are five different grounds of rejection of various groupings of these six claims. However, [**45] we find it necessary to discuss only McClellan taken with Grasselli '631, because of the descriptions of the catalysts of the references previously given.

To recapitulate, McClellan describes heat treatment (at 750 degrees to 850 degrees C) of bismuth molybdate, or bismuth phospho-molybdate, catalysts to render the crystalline structure amorphous, for use in oxydehydrogenations. McClellan, it was determined, suggests addition of iron to the basic catalyst. Moreover, it was determined that McClellan describes that those same catalysts will tolerate sodium or potassium ion impurities or contaminants to certain specified extents.

Grasselli '631 is directed to bismuth molybdate catalysts containing, in addition, the oxides of at least two transition metals, one of them being preferably iron, for use in oxydehydrogenations. Grasselli '631 is relied upon by the PTO for its description indicating that a portion of the bismuth in the base composition may be replaced by antimony, tin, copper, or arsenic. Grasselli '631 is silent with respect to the presence of alkali metal and describes a calcination temperature of above 500 degrees F (about 262 degrees C), [*746] which, according to [**46] Grasselli '631 Example 1, may be up to 800 degrees F.

Appealed claim 16 requires the inclusion of antimony in appellants' catalyst containing potassium as the alkali metal. Moreover, appealed claim 16 embraces the inclusion of the second transition metal required by Grasselli '631. On the basis of the record before us, it is our view that a person of ordinary skill would have expected that inclusion of antimony, suggested by Grasselli '631, in the catalyst suggested by McClellan, would produce a composition operative as a catalyst, for example, in oxydehydrogenations.

Appealed claim 17 specifies potassium as the essential alkali metal and activation at 500 degrees F (in air). Appellants argue that the temperature used by McClellan would destroy appellants' "activated catalytic oxide compound." In light of the description in both McClellan and Grasselli '631, more is necessary than appellants' argument with respect to the significance of appellants' temperature recitation. McClellan requires, as appellants point out, conversion of the crystalline composition to an amorphous form at 750-850 degrees C. However, McClellan also indicates that heat treatment at a lower temperature can [**47] produce conventional catalysts, but in crystalline rather than the amorphous form which McClellan requires. The Grasselli '631 description concerning catalyst calcination temperatures is cumulative to McClellan's description concerning the effect of calcination temperature on the crystalline form of the composition. If appellants' catalysts, made at the temperature specified in claim 17, exhibit unobvious properties over that described by McClellan, there is no proof of that fact in this record.

Accordingly, we affirm the rejections of claims 16 and 17 over McClellan in view of Grasselli '631.

However, the rejections of claims 22, 24, 29, and 31 over McClellan and Grasselli '631 are reversed for reasons set forth above. These claims require the essential alkali metal component of appellants' catalyst composition to be cesium or rubidium. As discussed in section IV D, above, McClellan does not describe cesium or rubidium in catalyst compositions; and Grasselli, silent with respect to alkali metals, cannot change that determination. [16]

16 Similarly, neither the Japanese Patent (which describes potassium and sodium salts specifically, and not alkali metal compounds and salts) nor any other art of record describes cesium or rubidium in any catalyst. *See* n. 11, *supra.*

[**48] Accordingly, the rejections under *35 U.S.C. § 103* of claims 15 and 19-32 are reversed, and rejections of claims 1-14, 16-18, 33 and 34 under *35 U.S.C. § 103* are affirmed.

AFFIRMED IN PART AND REVERSED IN PART.